

Amendment to the claims under PCT Article 19

CLAIMS

1. (amended) A foreign language learning device comprising:
word separation means (114) for receiving sentence speech
5 information, the sentence speech information corresponding to speech
produced successively by a learner when the learner utters a sentence
including a plurality of words, to separate said sentence speech information
into word speech information on the basis of each word included in said
sentence;
10 likelihood determination means (116) for evaluating degree of
matching of each said word speech information with a model speech; and
display output means (120) for displaying, for each said word, a
resultant evaluation determined by said likelihood determination means.
- 15 2. (amended) The foreign language learning device according to
claim 1, further comprising storage means (118) for storing a model
sentence to be pronounced by said learner and model phoneme array
information which corresponds to said model sentence and concerns the
whole of said model sentence, wherein
20 said display output means presents said model sentence to said
learner in advance, and
said word separation means includes
phoneme recognition means for recognizing said sentence speech
information on the basis of each phoneme information, and
25 word speech recognition means for recognizing said word speech
information for each said word according to said phoneme information and
said model phoneme array information after the separation.
- 30 3. The foreign language learning device according to claim 2,
wherein
said phoneme recognition means includes phoneme likelihood
determination means for determining likelihood of each phoneme
information in said sentence speech information, with respect to each of

Amendment to the claims under PCT Article 19

phonemes that can be included in said foreign language, and

said likelihood determination means evaluates the degree of matching of each said word speech information by comparing, on a likelihood distribution plane of phoneme information in said sentence speech information, each word likelihood determined along a path followed when pronunciation follows a phoneme array exactly the same as said model phoneme array information with the sum of word likelihoods determined along mistakenly utterable candidate paths from a speech waveform of pronunciation by the learner.

4. (amended) A foreign language learning method comprising the steps of:

receiving sentence speech information, the sentence speech information corresponding to speech produced successively by a learner when the learner utters a sentence including a plurality of words, and accordingly separating said sentence speech information into word speech information on the basis of each word included in said sentence (S106, S108);

evaluating degree of matching of each said word speech information with a model speech (S110); and

displaying, for each said word, a resultant evaluation of each said word speech information (S110).

5. (amended) The foreign language learning method according to claim 4, further comprising the step of presenting a model sentence to said learner in advance (S102), wherein

said step of separating said sentence speech information into said word speech information includes the steps of

recognizing said sentence speech information on the basis of each phoneme information (S106), and

recognizing said word speech information for each said word according to model phoneme array information which corresponds to the model sentence presented to said learner and concerns the whole of said

Amendment to the claims under PCT Article 19

model sentence and according to said phoneme information after the separation (S108).

6. The foreign language learning method according to claim 5,
5 wherein

said step of recognizing said sentence speech information on the basis of each phoneme information includes the step of determining likelihood of each phoneme information in said sentence speech information, with respect to each of phonemes that can be included in said foreign language, and

in said step of evaluating the degree of matching with the model speech, the degree of matching for each said word is evaluated by comparing, on a likelihood distribution plane of phoneme information in said sentence speech information, each word likelihood determined along a path followed when pronunciation follows a phoneme array exactly the same as said model phoneme array information with the sum of word likelihoods determined along mistakenly utterable candidate paths from a speech waveform of pronunciation by the learner.

20 7. The foreign language learning method according to claim 5, further comprising the step of evaluating a resultant pronunciation by said learner after practice of the pronunciation, said evaluation made on the basis of each said phoneme and said word in said model sentence uttered by said learner.

8. The foreign language learning method according to claim 7,
wherein

30 said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying a vocal tract shape model for each said phoneme via a display unit to said learner.

9. The foreign language learning method according to claim 7, wherein

Amendment to the claims under PCT Article 19

said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying, via a display unit to said learner, a model voice print and a voice print concerning pronunciation by said learner, said voice prints being compared with each other to be displayed.

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10. The foreign language learning method according to claim 7, wherein

said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying, via a display unit to said learner, position of pronunciation by said learner on a formant plane.

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11. A foreign language learning device comprising:

storage means (118) for storing a model sentence to be pronounced by a learner and model phoneme array information corresponding to said model sentence;

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display output means (104, 120) for presenting said model sentence to said learner in advance;

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word separation means (140.1) for receiving sentence speech information corresponding to a sentence pronounced by said learner to separate the sentence speech information into word speech information on the basis of each word included in said sentence;

likelihood determination means (140.4) for evaluating degree of matching of each said word speech information with a model speech; and

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display output means (120) for displaying, for each phoneme and each said word, a resultant evaluation by said likelihood determination means,

said word separation means including

phoneme recognition means for recognizing said sentence speech information on the basis of each phoneme information, and

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word speech recognition means for recognizing said word speech information for each said word according to said phoneme information and said model phoneme array information after the separation, and said foreign language learning device further comprising

Amendment to the claims under PCT Article 19

pronunciation evaluation means for evaluating a resultant pronunciation after practice of the pronunciation for each said phoneme and for each said word in said model sentence uttered by said learner in a pronunciation practice period.

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12. The foreign language learning device according to claim 11, wherein

said pronunciation evaluation means displays a vocal tract shape model for each said phoneme via a display unit to said learner.

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13. The foreign language learning device according to claim 11, wherein

said pronunciation evaluation means displays, via a display unit to said learner, a model voice print and a voice print concerning pronunciation by said learner, said voice prints being compared with each other to be displayed.

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14. The foreign language learning device according to claim 11, wherein

said pronunciation evaluation means displays, via a display unit to said learner, position of pronunciation by said learner on a formant plane.

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15. (amended) A computer-readable medium recorded thereon a program for executing a foreign language learning method by a computer, said foreign language learning method comprising the steps of:

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receiving sentence speech information, the sentence speech information corresponding to speech produced successively by a learner when the learner utters a sentence including a plurality of words, and accordingly separating said sentence speech information into word speech information on the basis of each word included in said sentence;

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evaluating degree of matching of each said word speech information with a model speech; and

displaying, for each said word, a resultant evaluation of each said

Amendment to the claims under PCT Article 19

word speech information.

16. (amended) The computer-readable medium according to claim 15, wherein

5 said foreign language learning method further comprising the step of presenting a model sentence to said learner in advance, wherein

said step of separating said sentence speech information into said word speech information includes the steps of

10 recognizing said sentence speech information on the basis of each phoneme information, and

recognizing said word speech information for each said word according to a model phoneme array information which corresponds to the model sentence presented to said learner and concerns the whole of said model sentence and according to said phoneme information after the separation.

17. The computer-readable medium according to claim 16, wherein said step of recognizing said sentence speech information on the basis of each phoneme information includes the step of determining likelihood of each phoneme information in said sentence speech information, with respect to each of phonemes that can be included in said foreign language, and

20 in said step of evaluating the degree of matching with the model speech, the degree of matching for each said word is evaluated by comparing, on a likelihood distribution plane of phoneme information in said sentence speech information, each word likelihood determined along a path followed when pronunciation follows a phoneme array exactly the same as said model phoneme array information with the sum of word likelihoods determined along mistakenly utterable candidate paths from a speech waveform of pronunciation by the learner.

18. The computer-readable medium according to claim 16, wherein said foreign language learning method further comprises the step of

Amendment to the claims under PCT Article 19

evaluating a resultant pronunciation by said learner after practice of the pronunciation, said evaluation made on the basis of each said phoneme and said word in said model sentence uttered by said learner.

5 19. The computer-readable medium according to claim 18, wherein said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying a vocal tract shape model for each said phoneme via a display unit to said learner.

10 20. The computer-readable medium according to claim 18, wherein said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying, via a display unit to said learner, a model voice print and a voice print concerning pronunciation by said learner, said voice prints being compared with each other to be displayed.

15 21. The computer-readable medium according to claim 18, wherein said step of evaluating a resultant pronunciation after practice thereof includes the step of displaying, via a display unit to said learner, position of pronunciation by said learner on a formant plane.

20 22. (amended) A computer program for executing a foreign language learning method by a computer, said foreign language learning method comprising the steps of:

25 receiving sentence speech information, the sentence speech information corresponding to speech produced successively by a learner when the learner utters a sentence including a plurality of words, and accordingly separating said sentence speech information into word speech information on the basis of each word included in said sentence;

30 evaluating degree of matching of each said word speech information with a model speech; and

 displaying, for each said word, a resultant evaluation of each said word speech information.